REMARKS:

The applicant appreciates the Examiner's thorough consideration of the application and detailed comments. The following addresses the examiner's objection as enumerated in the action mailed 5/19/99:

1) Claim 11 cancelled.

2) So noted.

3),4) Claims 1-3 cancelled.

5),6) Claim 11 cancelled.

7), 8) The examiner remarks that Tak (5635956) teaches in FIGS. 4 and 6 of a device for measuring motion corresponding to coordinate information for input into a computer which includes a ball with a repeating pattern of contrasting geometrical shapes.

Claim 12 has been amended to include limitations that address the examiner's objections and clarify the intent of the claim.

DISCUSSION

Tak is silent on the issues raised by the naive application of the structured cartesian grid onto a spherical ball. Tak teaches in FIGS. 6A and 6B to apply a structured Cartesian grid onto the surface of a spherical ball. Tak shows a pattern of small square areas in FIGS. 6A and 6B, where the length of the grid shown is only a small fraction of the diameter of the sphere, so that the area covered by the grid is relatively flat. However, this structures pattern breaks down when naively applied to a full spherical ball. It is not mathematically possible to extend such a structured array of square regions to cover the entire sphere without breaking the pattern and introducing special nodes.

To illustrate the impossibility of this by example, the square grid proposed by Tak could be applied to the earth's spherical surface near the equator. As the grid is extended north, the longitude lines converge so that the square grid elements become narrowed rectangles. When the grid is extended to the North Pole, the northernmost rectangular elements degenerate to triangles with the tips of many triangles meeting at the North pole.

In contrast, the applicant has experimented by constructing models of geometrial polyhedra such as those shown in FIGS 10A through 10E of the instant invention. The patterns of triangles or other polygons in these polyhedra can be repeated and extended to cover the entire spherical surface, with all edges, vertices, and polygons

exactly the same. Such a regular, repeating pattern enables accurate tracking of the ball rotation irrespective of the ball's orientation.

The applicant has also derived and disclosed the formulae for triangulation in which areas on the ball surface can be subdivided with line segments in to smaller areas for better resolution. The applicant has also derived and disclosed formulae by which these line segments can be mapped into curved arcs on the ball surface. These derivations appear in a section entitled "TRIANGULATION" beginning on P39 of the current application.

Through this experimentation, the applicant has developed and disclosed the advantages of the regular repeating pattern that can be formed by these triangles and polyhedra (p44, first paragraph). The vertices of form "cross hair" that can give increased accuracy in the trackball position.

9) So noted.

10), 11) Claims 4-8 and 10 cancelled.

12),13) Claims 7, 9 cancelled.

14), 15) The dependent claims 13-16 contain language describing specific patterns on the spherical surface. These patterns have advantages described in the above response to examiner's points 7) and 8) and elaborated on here.

The Platonic solids claimed in 13) provide a unique ability for a repeated pattern which enables consistent accuracy regardless of ball orientation. Tak teaches away from this in the FIGS. 6A and 6B.

The triangular patterns claimed in 14) allow for more intersections at the vertices for better "cross hair" accuracy. Also, unlike the structured square grid disclosed by TAK, the instant invention teaches how to extend a triangular grid in a regular pattern over the entire ball surface (see FIG. 10E, 11A, and 11B).

The projection of line segments claimed in 15) uses the teachings of the current disclosue to map long, straight segments onto the surface so that large coarse line segments can be accurately projected onto long curves on the surface.

The tiling claimed in 15) allows the the teachings of the instant invention to give a repeated pattern for which the sensor may detect the ball movement indepsndently of the ball orientation. Tak teaches no such motivation for a repeated pattern nor of any method to construct such such a repeatable tiled pattern.

16),17) Claims 17-20 cancelled.

18) So noted.

19) So noted.

Request for Constructive Assistance

The undersigned has amended the remaining independent claim 12 to conform to the examiner's requirements for defining novel and unobvious structure which also produces new and unexpected results. The undersigned has also added claims 21 through 30, in which he believes describe a novel and unobvious invention and has made diligent efforts to conform to the proper format for patent claims. If, for any reason the claims of this application are not believed to be in full condition for allowance, applicant respectfully requests the constructive assistance and suggestions of the Examiner in making constructive suggestions pursuant to MPEP 706.03(d) in order that this application can be placed in allowable condition as soon as possible and without the need for further proceedings.

PETITION FOR EXTENSION OF TIME
(Rules 136 and 17(a)-(d))

Outstanding Office Action Mailed:	5/19/99
Original Period of Response Expired:	8/19/99
Request for extension of 1 month to:	9/19/99
Small Entity Petition Fee Enclosed:	$55

Sir:

In the above application, applicant respectfully petitions that the period for response for the outstanding Office Action indicated above be extended for the additional month(s) indicated above. A response to such Office Action and the above Petition Fee (Small Entity) are enclosed herewith. (This extension will not extend the time over the statutory period of six months from the date of Office Action.)

Very respectfully,

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